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.

UNITED STATES DISTRICT COURT
NORTHERN DISTRICT OF CALIFORNIA
SAN FRANCISCO DIVISION

ASETEK DANMARK A/S

Plaintiff and Counterdefendant,

v.

COOLIT SYSTEMS, INC., COOLIT SYSTEMS USA INC., COOLIT SYSTEMS ASIA PACIFIC LIMITED, COOLIT SYSTEMS (SHENZHEN) CO., LTD.,

Defendants and Counterclaimants

CORSAIR GAMING, INC. and CORSAIR MEMORY, INC.

Defendants.

CASE NO. 3:19-cv-00410-EMC

JOINT SUPPLEMENTAL CLAIM CONSTRUCTION AND PRE-HEARING STATEMENT UNDER PATENT L.R. 4-3

Pursuant to Patent L.R. 4-3, Plaintiff and Counter-defendant Asetek Danmark A/S ("Asetek") and Defendant and Counter-claimant CoolIT Systems Inc. ("CoolIT") and Defendants Corsair Gaming, Inc. and Corsair Memory, Inc. (collectively "Corsair"), (Plaintiff and Defendants, collectively the "Parties") jointly submit this Joint Supplemental Claim Construction and Prehearing Statement (the "Statement") for U.S. Patent Nos. 10,599,196 ("the '196 patent"), 10,613,601 ("the '601 patent") and 8,746,330 ("the '330 patent").

Asetek's position regarding further claim construction: Asetek's request to construe two phrases, one each from the '601 patent and the '330 patent, is entirely proper and in direct response to CoolIT's actions/positions taken after claim construction was fully briefed and a hearing was set. More specifically, Asetek's request to construe one phrase in the '601 patent that is also present in the '354 patent is the direct result of CoolIT's unforeseeable and unsupported position regarding a prior art reference that CoolIT did not assert until after claim construction had been fully briefed. Similarly, the need to construe one additional phrase in the '330 patent is the direct result of CoolIT's changed infringement theories following receipt of the Claim Construction Order (in CoolIT's recently amended infringement contentions). Thus, Defendants' assertion that Asetek should have asked to construe these two phrases before CoolIT's unexpected changes of position is disingenuous.

Defendants' position regarding further claim construction: Defendants do not support further claim construction on the disputed claim terms in Section II below. Both disputed claim terms were terms that Plaintiff could have previously disputed. (1) The exact same claim term "direct the cooling liquid from the central region toward the perimeter of the lower chamber" in the claims of the newly asserted '601 patent is also found in asserted claim 1 of U.S. Patent No. 10,078,354 ("the '354 patent"). The Court already held a claim construction hearing on the '354 patent. (2) As set forth in the Corrected Further Joint Case Management Statement and [Proposed] Order (D.I. 222-2), the Parties dispute whether further claim construction is warranted for the '330 patent.

This Statement contains information on claim construction for these patents under Patent L.R. 4-3 as follows.

I. STIPULATED CLAIM CONSTRUCTION UNDER PATENT L.R. 4-3(A)

To narrow their disputes, the Parties have met and conferred and have reached agreement on claim construction for the following claim terms:

Claim Terms	Patent No./Claim No.	Stipulated Construction
"reservoir"	'196 patent, claims 1 and 10 '601 patent, claims 1, 6, 12	"single receptacle defining a fluid flow path" per the parties' stipulated construction in the prior Joint Claim Construction and Prehearing Statement (Dkt. 67).
"[upper/lower /pump/thermal exchange] chamber(s)"	'196 patent, claims 1, 2, 10 '601 patent, claims 1, 6, 12	The term "chamber" should be construed as: "compartment within the reservoir" [with "reservoir" construed as indicated above], per the parties' stipulated construction in the prior Joint Claim Construction and Prehearing Statement (Dkt. 67).
"double-sided chassis"	'196 patent, claims 1, 10, 13	"two-sided frame" per the Court's July 22, 2020 Claim Construction Order (Dkt. 149)
"stator"	'196 patent, claims 1, 10, 13	"stationary parts of the motor that perform or support an electrical or magnetic function of the motor," per the Court's July 22, 2020 Claim Construction Order (Dkt. 149)
"either a first end or a second end of the thermal exchange chamber"	'196 patent, claim 2	"either the first end or the second end of the thermal exchange chamber," per the parties' agreement reflected in email correspondence between counsel dated March 18, 2021 [correcting antecedent basis]

II. DISPUTED TERMS, PROPOSED CONSTRUCTIONS, AND SUPPORTING EVIDENCE UNDER PATENT L.R. 4-3(B)

Claim Terms	Asetek's Proposed Construction and Support	Defendants' Proposed Construction and Support

"direct the cooling liquid from the central region toward the perimeter of the lower chamber" '601 patent [Asetek patent], claims 1, 6, 12	**Proposed Construction:** "direct the cooling liquid from the central region through the lower chamber toward the perimeter of the lower chamber" **Intrinsic Evidence** '601 patent, Figure 9 and associated texts '601 patent, 15:25-30 Tilton Decl., IPR2020-00523 (Ex. 2018), at ¶¶41-65. Asetek may also cite to evidence cited by CoolIT.	**Proposed Construction:** No construction is necessary. Defendants object to Asetek's proposal to construe this term, as it is already in asserted claim 1 of the '354 patent. Defendants reserve their right to assert the term "central region" as invalid under 35 U.S.C. § 112. **Intrinsic Evidence** '354 patent, FIGs. 9-16, 15:25-18:25. '601 patent, FIGs. 9-16 15:25-18:26. POPR, IPR2020-00523 (Paper 6), at 20-21. POR, IPR2020-00523 (Paper 21), at 16-25. Tilton Decl., IPR2020-00523 (Ex. 2018), at ¶¶41-65. **Extrinsic Evidence** Expert testimony establishing a POSITA's understanding of the plain and ordinary meaning of the claimed terms when read in view of the specification and other intrinsic and extrinsic evidence.
Plaintiff's identification of term: "first/second side of the fins" (claim 1); "first/second side of the plurality of juxtaposed fins" (claims 12 and 14) '330 patent [CoolIT patent], claims 1, 12, and 14	**Proposed Construction:** "the outer sides of the outermost fins in the entire array of fins" **Intrinsic Evidence** '330 patent, Figures 1-5 **Extrinsic Evidence**	**Proposed Construction:** Plain & ordinary meaning. Defendants object to Asetek's proposal to construe this term, as claim construction for the '330 patent was already completed. **Intrinsic Evidence**

Defendants' identification of term: "first/second side of the [plurality of] fins" (claim 1); "first/second side of the plurality of juxtaposed fins" (claims 12 and 14) '330 patent [CoolIT patent], claims 1, 12, and 14	CoolIT's original infringement contentions for the '330 patent Deposition testimony from CoolIT's expert Dr. Pokharna taken on December 16, 2019: 102:20-106:14 and Exhibit 40 Deposition Testimony from Asetek's expert Dr. Tilton in IPR2020-00825: 12:22-18:23; 81:6-88:20; 174:19-178:7; 179:24-180:9; 181:13-182:11; 188:24-189:5; and deposition exhibits/documents discussed during said testimony. Asetek may also cite to evidence cited by CoolIT.	File History ("FH"), 2014-04-14, Proposed Claim Amendments FH, Notice of Allowance, with Examiner-Initiated Interview Summary (2014-04-28) FIGs. 1-5; Abstract; col. 1:7-8; col. 1:12-16; col. 1:20-67; col. 3:21-26; col. 4:4-10; col. 5:9-12; col. 8:12-25; col. 9:4-10; col. 9:28-37; col. 10:17-23. **Extrinsic Evidence** Expert testimony establishing a person of ordinary skill in the art's ("POSITA") understanding of the plain and ordinary meaning of the claimed terms when read in view of the specification and other intrinsic and extrinsic evidence does not require all fins of a heat spreader plate. Tilton Depo., IPR2020-00825 (Ex. 2050), at 14:1-18:23, 88:24-90:7, 174:19-176:15. POPR, IPR2020-00524 (Paper 6), at 36.39. Chambers Dictionary (10th ed. 2007), at 1170, 1420 [COOLIT0017001-COOLIT0017007]. Merriam Websters Dictionary (11th ed. 2007), at 955, 1157 [COOLIT0017008-COOLIT0017013]. Penguin's Complete English Dictionary (2006), at 1073, 1298 [COOLIT0017014-COOLIT0017019].

III. IDENTIFICATION OF CASE-DISPOSITIVE TERMS UNDER PATENT L.R. 4-3(C)

Asetek identifies both terms in Section II above as case or claim dispositive terms for the Court's consideration.

IV. ANTICIPATED LENGTH OF CLAIM CONSTRUCTION HEARING UNDER PATENT L.R. 4-3(D)

The Parties believe one (1) hour would be sufficient for the hearing.

V. PROPOSED CLAIM CONSTRUCTION WITNESSES PURSUANT TO PATENT L.R. 4-3(E)

A. Asetek's Statement

Asetek is only relying on testimony from Asetek's expert, Dr. Donald Tilton, that was previously given in *inter partes* review proceedings involving the asserted Asetek and CoolIT patents-in-suit. Asetek will not call any live witness at the claim construction hearing.

B. Defendants' Statement

Defendants intend to rely on Dr. Himanshu Pokharna for his expert testimony to support their claim construction positions. Dr. Pokharna's qualifications and detailed opinions have been set forth in Exhibit A attached hereto. Defendants will not call any live witness at the claim construction hearing.

Respectfully submitted,

Dated: March 19, 2021

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ATTESTATION

Counsel for Asetek Danmark A/S hereby attests by his signature below that concurrence in the filing of this document was obtained from counsel for CoolIT Systems, Inc., CoolIT Systems USA Inc., CoolIT Systems Asia Pacific Limited, CoolIT Systems (Shenzhen) Co., Ltd., Corsair Gaming, Inc., and Corsair Memory, Inc.

Dated: March 19, 2021

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UNITED STATES DISTRICT COURT

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ASETEK DANMARK A/S,

Plaintiff and Counter-defendant,

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COOLIT SYSTEMS, INC.,

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CORSAIR GAMING, INC. and CORSAIR MEMORY, INC.,

Defendants.

Case No. 3:19-cv-00410-EMC

DECLARATION OF HIMANSHU POKHARNA, PH.D.

I, Himanshu Pokharna, Ph.D., declare:

I. INTRODUCTION

A. Qualifications and Experience

1. I am an engineer with 25 years of global experience in a variety of leadership roles. My educational, research and work experience has revolved primarily around energy, materials, and thermal technologies. I have expertise in creating product strategy by mapping technology competencies to emerging market opportunities. My background allows me to be comfortable in the deepest of technical discussions with engineers to broad, board-level business deliberations. I have a proven track record of successfully introducing new energy/mechanical/thermal technologies across a broad array of computing, energy and military/aerospace products. I am experienced in building and leading teams of engineers, technicians, and business people across geographies.

2. I am currently the Founder and Director of Deep Materials Inc., a company devoted to developing thermal management components such as thermal interface materials and heat sinks for computing and consumer electronic systems. In addition, I serve as a founder and board member of Inficold which is developing thermal energy storage systems for refrigeration and air-conditioning equipment with emphasis on cold storage and milk cooling. I also have other interests including being a principal of Deeia Inc., a consulting business providing thermal design support to clients such as Google, Facebook, and startups for thermal design of consumer electronics and computing devices.

3. I received a Bachelor's of Technology and a Master's of Technology (equivalent to a B.S. and an M.S. in the United States, respectively) in mechanical engineering from the Indian Institute of Technology, Bombay. I also earned a Ph.D. in Nuclear Energy Engineering from Purdue University in 1997. My Ph.D. thesis focused on modeling of two-phase flow dynamics in heat transfer systems and specifically developed analytical models for the simultaneous flows of water and water vapor in a system during heat absorption. Examples of such systems are boiling water reactors. In addition, I have an MBA degree from the Wharton School at the University of Pennsylvania.

4. I have worked in various capacities in the electronics industry since 1997. My experience includes leading a team of over 25 engineers at Intel Corporation in the development of thermal management technology for laptop computers. My areas of expertise include thermal management of electronics and energy systems. I have published more than 15 peer-reviewed scientific articles and have made many presentations at scientific and industrial conferences, including several keynote addresses at industry forums such as the Taiwan Thermal Management Association ("TTMA") annual meetings, with the primary emphasis being heat-pipe development. I have over sixty issued or pending patents.

5. Prior to my team management responsibility at Intel, I specifically worked on liquid cooling of computing systems and demonstrated one of the first two-phase liquid cooling pumped loop coolers in a thin and light laptop computer. This work resulted in a keynote address to the Second International Conference on Microchannel and Minichannels held in Rochester, NY (June 17-19, 2004).

6. A copy of my Curriculum Vitae ("CV"), which describes my education, training, and experience in greater detail, is appended hereto. My CV includes a list of publications I have authored, as well as a list of the patents on which I am a named inventor.

7. I am being compensated for the time I spend working on this matter at my standard rate of $400 per hour. My compensation does not depend in any way upon the outcome of this proceeding, and I hold no financial interest in CoolIT Systems, Inc. ("CoolIT"), Corsair Gaming, Inc. and Corsair Memory, Inc. (collectively, "Corsair"), or Asetek A/S Danmark ("Asetek").

II. PERSON OF ORDINARY SKILL IN THE ART

8. I understand that an assessment of claims of the asserted patents should be undertaken from the perspective of a person of ordinary skill in the art ("POSITA") as of the earliest claimed priority date for the claimed subject matter, which I have assumed to be August 9, 2007 for U.S. Patent No. 8,746,330 (the "'330 patent") and November 8, 2004 for U.S. Patent No. 10,613,601 the "'601 patent."

9. In my opinion, a person of ordinary skill in the art in the context of the '601 and '330 patents (around 2004 to 2007) would have earned at least a bachelor's degree, such as a B.S.

(bachelor of science), or equivalent thereof, in mechanical engineering or a closely-related field and possessed at least three years of specialized experience in heat transfer devices for thermal management in electronics and computer systems, or in similar systems.

10. Although my qualifications and experience exceed those of the person having ordinary skill in the art defined above, the analysis and opinions I have provided in this Declaration are based on the perspective of a person of ordinary skill in the art in 2004 to 2007.

III. BRIEF TECHNOLOGY BACKGROUND

A. Introduction to Electronics Cooling

11. New generations of electronic devices such as microprocessors, graphics processors, and power electronics semiconductor devices produce increasing amounts of heat during their operation. If the heat is not removed at a sufficient rate, the devices can overheat, decreasing performance, reliability, or both, and in some cases component damage or failure.

12. The industry has responded to this challenge with a number of approaches for transferring heat from electronic components to another medium. For example, industry has developed systems that use air cooling to transfer and dissipate heat from the electronic devices to an ultimate heat sink, like air. Conventional air cooling uses a fan mounted near a heat producing device to replace heated air with cooler ambient air. Such air-cooling techniques can be supplemented with a conventional "heat sink," often a plate of a thermally conductive material (such as aluminum or copper) in thermal contact with the heat-producing device. The heat sink can spread heat from the device to a larger area for dissipating heat to the surrounding air. Some heat sinks include "fins" (as shown on the right) to increase the area available for heat transfer and thereby to improve the transfer of heat to the air. Some heat sinks include a fan to force air among the fins and are commonly referred to in the art as "active" heat sinks. The thermal conductivity value of the plate's material is critical to heat dissipation efficiency.

B. Introduction to Liquid Cooling Technologies for Electronics

13. Another type of cooling system for electronic components is a liquid cooling system

(involving one- or two-phases with say, water or refrigerant, respectively). Liquid cooling improves cooling performance compared to air cooling techniques described above, as liquids such as water have significantly better heat transfer capabilities than air. CoolIT's '330 patent is directed at liquid cooling technologies.

IV. CLAIM CONSTRUCTION TERMS:

14. I have reviewed the terms, **"a plurality of fins"** and **"a plurality of juxtaposed fins,"** recited in the independent claims of the '330 patent. These terms have a plain and ordinary meaning to one of ordinary skill in the art and, therefore, I do not think any construction is necessary. To the extent construction is necessary, one of ordinary skill in the art would understand "a plurality of fins" / "a plurality of juxtaposed fins" to mean "more than one fin" / "more than one juxtaposed fin." I have reviewed Asetek's proposed construction and disagree that "a plurality of fins" / "a plurality of juxtaposed fins" must include "the entire array of fins."

15. I have reviewed the specification and the file history of the '330 patent and the specification and the file history do not assign any special meaning to the word "plurality" or to the terms "a plurality of fins" and "a plurality of juxtaposed fins." One of ordinary skill in the art, reviewing the specification and the file history, would understand that these terms have their plain and ordinary meaning – "a plurality of fins" / "a plurality of juxtaposed fins" means "more than one fin" / "more than one juxtaposed fin.".

16. The claimed inventions are directed to "a fluid heat exchanger for an electronics application such as in a computer system." ('330 patent, col. 1:7-8.) The specification explains: "Fluid heat exchangers are used to cool electronic devices by accepting and dissipating thermal energy thereform. Fluid heat exchangers seek to dissipate to a fluid passing therethrough, thermal energy communicated to them from a heat source." ('330 patent, col. 1:12-16.) Notably, there is no requirement in the language of independent claims 1, 12, or 14, or in the specification of the '330 patent that fluid flow through each and every microchannel formed by the fins on a heat spreader plate. Rather one of ordinary skill in the art would understand that the terms "a plurality of fins" and "a plurality of juxtaposed fins" to be the fins that define the microchannels that are designed to receive cooling fluid to cool the heat spreader plate, which is in contact with the

computer chip and which in turn cools the computer chip. There is no requirement that every single microchannel receive fluid in order to cool the heat spreader plate or the computer chip.

17. First, a manufacturer would be motivated to create a few extra microchannels on the heat spreader plate by producing a few more fins such that the "elongate fluid inlet opening" (claim 1) / "elongate aperture" (claim 12) / "inlet" (claim 14) size does not need to precisely match the total amount of microchannels on the heat spreader plate. In doing so, the "elongate fluid inlet opening" (claim 1) / "elongate aperture" (claim 12) / "inlet" (claim 14) size can vary with a higher tolerance while always being ensured to have enough microchannels to send liquid to. This higher tolerance can save costs significantly because lower precision manufacturing of the "elongate fluid inlet opening" (claim 1) / "elongate aperture" (claim 12) / "inlet" (claim 14) is less expensive. It can also increase reliability because ensuring the "elongate fluid inlet opening" (claim 1) / "elongate aperture" (claim 12) / "inlet" (claim 14) not exceed the available microchannels can prevent short-circuiting/leaking of the liquid directly from the inlet header (region) to the outlet header (region). That is, the liquid will be ensured to go from the "elongate fluid inlet opening" (claim 1) / "elongate aperture" (claim 12) / "inlet" (claim 14) "into" (and through) the microchannels to the outlet header (region).

18. Second, one of ordinary skill in the art would understand that an entire heat spreader plate can be cooled without requiring every single microchannel to receive fluid. It is typically sufficient, for example, that most of the microchannels receive fluid. This is because the walls of the microchannels are typically made of a high thermal conductivity material as the '330 patent teaches and as shown in Figure 2 below:

> "Surface 102a and microchannel walls 110 allow the fluid to undergo exchange of thermal energy from the heat spreader plate to cool the heat source coupled to the heat spreader plate. The upper surface 102a and walls 110 have a *high thermal conductivity* to allow heat transfer from the heat source 107 to fluid passing through channels 103."

('330 patent, 3:21-26 (emphasis added).) A person of ordinary skill in the art would understand that the high thermal conductivity of upper surface 102a and walls 110 would allow heat to be dissipated from microchannels that do not receive fluid because the heat from those areas would

spread to microchannels that did contact fluid as the heat from the fluid contacting microchannels was transferred to the fluid.

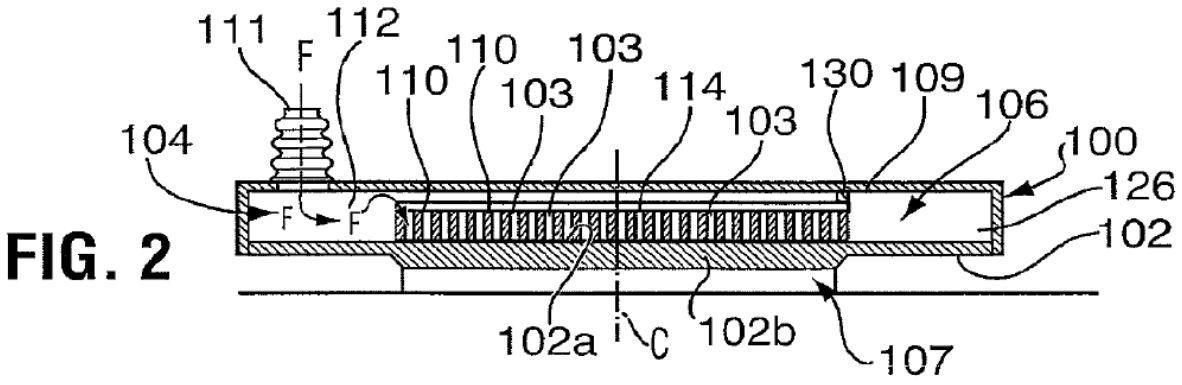


FIG. 2

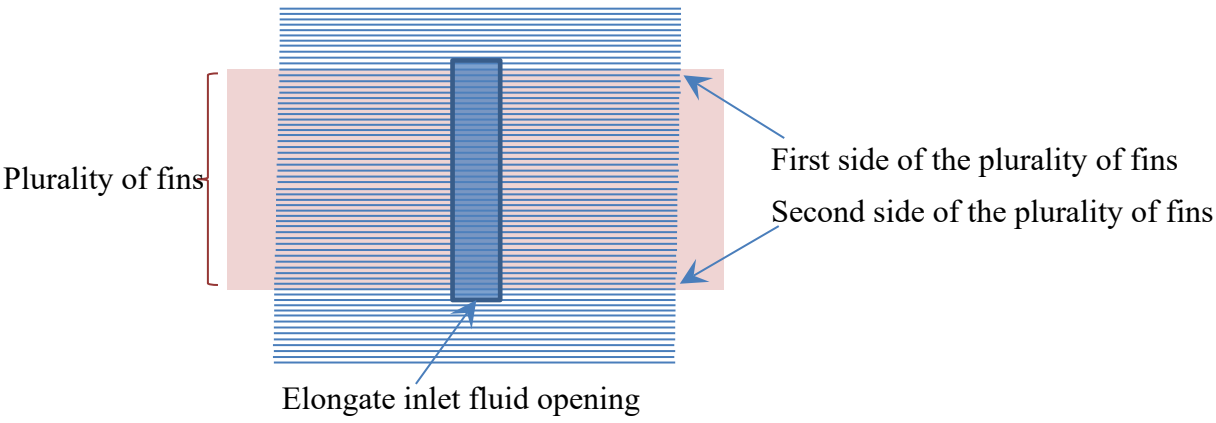
19. Third, the surface area of a heat spreader plate will be larger than the surface area of a computer chip. In this common scenario, the portions of the heat spreader plate that are not in contact with the heat generating element and relatively far from the heat generating element will not have significant heat flux and will not require cooling.

20. The understanding of a person of ordinary skill in the art is further supported by the plain and consistent dictionary definitions of the word "plurality." The first definition of "plurality" in The Chambers Dictionary is "the state or fact of being plural." The Chambers Dictionary further defines "plural" as "numbering more than one; more than onefold; expressing more than one, or where dual is recognized more than two." Similarly, the first definition of "plurality" in Merriam-Webster's Collegiate Dictionary is "the state or fact of being plural." Merriam-Webster's Collegiate Dictionary further defines "plural" as "**1**: of, relating to, or constituting a class of grammatical forms usu. used to denote more than one or in some languages more than two **2**: relating to, consisting of, or containing more than one or more than one kind or class <a ~ society>." Likewise, the first definition of "plurality" in the Penguin Complete English Dictionary is "the state of being plural or numerous." The Penguin Complete English Dictionary further defines "plural" as "**1** in grammar, said of a word or word form: denoting more than one, or in some languages more than two or three, persons, things, or instances; compare DUAL, SINGULAR. **2** consisting of or containing more than one kind, thing, or class: *a plural society*." The above dictionary definitions support that one of ordinary skill in the art would understand the plain meaning of "plurality" to be

"more than one" and the terms "a plurality of fins" / "a plurality of juxtaposed fins" to mean "more than one fin" / "more than one juxtaposed fin."

21. I have also reviewed relevant portions of Dr. Tilton's deposition in IPR2020-00825, involving related U.S. Patent No. 10,274,266, where he was asked about the meaning of the terms "plurality" and "a plurality of juxtaposed fins." In supporting his opinion that prior art read onto these terms, Dr. Tilton testified that "plurality" means "more than one." (12/17/2021 Deposition of Donald Tilton, Ph.D. at 89:19-20.) Dr. Tilton's testimony regarding "plurality" is consistent with mine and what one of ordinary skill in the art would understand "plurality" to mean. Dr. Tilton also made clear that "a plurality of juxtaposed fins" does not require all the fins on a heat spreader plate. (12/17/2021 Tilton Depo. at 14:1-18:23; 88:24-90:7.) To Dr. Tilton, "the claim term 'a plurality of juxtaposed fins' includes substantially all the fins, but does not require all of the fins on the heat spreader plate." (12/17/2021 Tilton Depo. at 18:13-23.) I note that Dr. Tilton's testimony's contradicts Asetek's position that "a plurality of fins" / "a plurality of juxtaposed fins" must include "the entire array of fins."

22. Because "a plurality of fins" / "a plurality of juxtaposed fins" does not require the entire array of fins, a **"first/second side of the [plurality of] fins"** simply means one side of the plurality of fins / the other side of the plurality of fins. Similarly, because "a plurality of juxtaposed fins" does not require the entire array of fins, a **"first/second side of the plurality of juxtaposed fins"** simply means one side of the plurality of juxtaposed fins / the other side of the plurality of juxtaposed fins. No construction is necessary as this is how one or ordinary skill in the art would understand the plain and ordinary meaning of these words. This is illustrated in the following figure:



23. Asetek's requirement that the first / second side needs to be the outermost fin in the entire array of fins is contrary to the plain and ordinary meaning. Further, Asetek's requirement is contrary to the purpose of the claimed invention. As I explained in Paragraphs 16-19, above, one of ordinary skill in the art would understand that the terms "a plurality of fins" and "a plurality of juxtaposed fins" to be the fins that define the microchannels that are designed to receive cooling fluid to cool the heat spreader plate, which is in contact with the computer chip and which in turn cools the computer chip. As explained above, there is no requirement that every single microchannel receive fluid in order to cool the heat spreader plate or the computer chip. In fact, the claim language supports that only fins that form microchannels that receive cooling fluid "through the elongate fluid inlet opening" should be included in the "plurality of fins." This is because the claim language states that "the plurality of fins defines a corresponding plurality of microchannels" and because otherwise the claim limitation that "the fins … are arranged such that the heat transfer fluid is directed … through the elongate fluid inlet opening … into the microchannels" will not be satisfied. ('330 patent, claim 1, col. 7:46-47, 8:19-25; *see also id.*, claim 12, col. 9: 39-42 ("a plurality of juxtaposed fins defining a corresponding plurality of juxtaposed microchannels . . . a flow of fluid from the inlet aperture of the housing to the inlet header region must pass through the elongate aperture of the plate and into the plurality of juxtaposed microchannels"); *id,* claim 14, col. 10:6-7 ("a plurality of juxtaposed fins defining a corresponding plurality of juxtaposed microchannels … a fluid flow from the inlet header region is directed through the inlet to the microchannels").) Therefore, a "first side of the [plurality of] fins" / "first

side of the plurality of juxtaposed fins" and a "second side of the [plurality of] fins" / "second side of the plurality of juxtaposed fins" refer to the sides of those plurality of fins that are relevant and designed to receive cooling fluid to cool the heat spreader plate.

24. To the extent a "side" of a plurality of "fins" refers to a fin located at a boundary of the plurality of fins, the "side" denotes that fin as the side or boundary under the plain and ordinary meaning of the word "side." A person of ordinary skill in the art would not understand the side here to mean that it was restricted to the physical inside or outside of the last fin located at a boundary of the plurality of fins, but rather could include either or both. Not only is this how one of ordinary skill would understand the word "side," this meaning is also further supported by dictionary definitions. The Chambers Dictionary provides the following relevant definition of "side": "a line or surface forming part of a boundary, the part near such a boundary." Similarly, Merriam-Webster's Collegiate Dictionary provides the following relevant definitions of "side": "either surface of a thin object <one ~ of a record>"; "a bounding line of a geometric figure <~ of a triangle>." Likewise, the Penguin Complete English Dictionary provides the following relevant definition of "side": "either surface of a thin object: *the other side of the page*; *the right side of the cloth*"; "the boundary line of a geometrical figure" "a region or direction considered in relation to a centre or line of division; *the south side of the city*; *surrounded on all sides*."

25. This understanding by a person of ordinary skill in the art is supported by the prosecution history. During an interview that took placed on April 11, 2014, "[t]he Examiner suggested *placing language in the independent claims that included two headers being opposite one another* and then defining the flow path of the fluid from the inlet through the device, to the outlet." (Notice of Allowance, Examiner-Initiated Interview Summary (emphasis added.)) The patentee agreed, and the additional language "that included two headers being opposite one another" was the phrase at issue: "a region of the inlet header is positioned adjacent a first side of the fins and a region of the outlet header is positioned adjacent the second side of the fins" and "the fins, the plate, the housing, and the seal are arranged such that the heat transfer fluid is directed from the inlet opening to the inlet header, through the elongate fluid inlet opening defined by the plate and into the microchannels, from the microchannels to the outlet header, and from the outlet

header to the outlet defined by the housing." Reading this, a person of ordinary skill in the art would understand that the "first side of the fins" and the "second side of the fins" simply meant they were "opposite one another" such that "a region of the inlet header" and "a region of the outlet header" are adjacent to the two sides, respectively. That is, the "sides" meant only the two opposite directions, such that they are in no way restricted to only the "outer" sides of the fins located at the two opposite boundaries, respectively. Further, a person of ordinary skill in the art would read "the fins" referring to its antecedent basis, i.e., "a plurality of fins," to include fins that form microchannels that receive cooling liquid through the "elongate fluid inlet opening." The same applies to the parallel claim language in claims 12 ("elongate aperture" / "inlet/outlet header region") and 14 ("inlet" / "inlet/outlet header region").

26. I note that Asetek cites to my earlier claim construction deposition on December 16, 2019 as purportedly supporting Asetek's construction. My earlier testimony does not support Asetek's proposed construction. During that deposition, I was not asked for my opinion on the meaning of "a plurality of fins" / "a plurality of juxtaposed fins," nor was I asked for my opinion of a "first/second side of the [plurality of] fins" / "first/second side of the plurality of juxtaposed fins." My understanding is that neither side disputed the meaning of any of these terms during the prior claim construction proceedings. Further, I understand that if there is no dispute and no express construction, then the plain and ordinary meaning of the words should apply. Finally, I am not aware of anything that happened in the intervening time to change what a person of ordinary skill would have understood that plain and ordinary meaning to be.

27. I was asked during the December 16, 2019 deposition about a specific embodiment of the '330 patent shown in Figure 1 of the '330 patent. I was asked: "Where is the first side of the plurality of fins ***in*** *Figure 1 of the '330 patent*?" (12/16/2019 Deposition of Himanshu Pokharna, Ph.D. at 102:20-22 (emphasis added).) I was asked a similar question regarding the second side of the plurality of fins in Figure 1. (12/16/2019 Pokharna Depo. at 103:12-14.) I pointed to sides for the specific embodiment in Figure 1 as one way in which the embodiment in Figure 1 could satisfy the claim language as depicted in the annotated Figure 1 of Exhibit 40 of the deposition (reproduced below). I never specifically testified that a side of the fins in Figure 1 refers

to any single fin. Indeed, the drawings were hand-made and imprecise, and as can be looked at closely below, on both "sides" indicated by me, more than one line was drawn on each side because it was meant to indicate the general location of each "side," not an engineering drawing of any specific single fin. Further, the arrows labeled as the "FIRST SIDE OF FINS" and "SECOND SIDE OF FINS" merely indicated the general locations of the sides of the fins, not the inside or outside "side" of any particular fin. For example, as can be seen below, the arrow labeled as the "SECOND SIDE of FINS" points to the *second and inner* line as opposed to the *first and outer* line. Thus, it would be incorrect to *interpret* the drawings to limit a "side" to any specific fin, let alone its inside or outer side, because that was simply not my testimony.

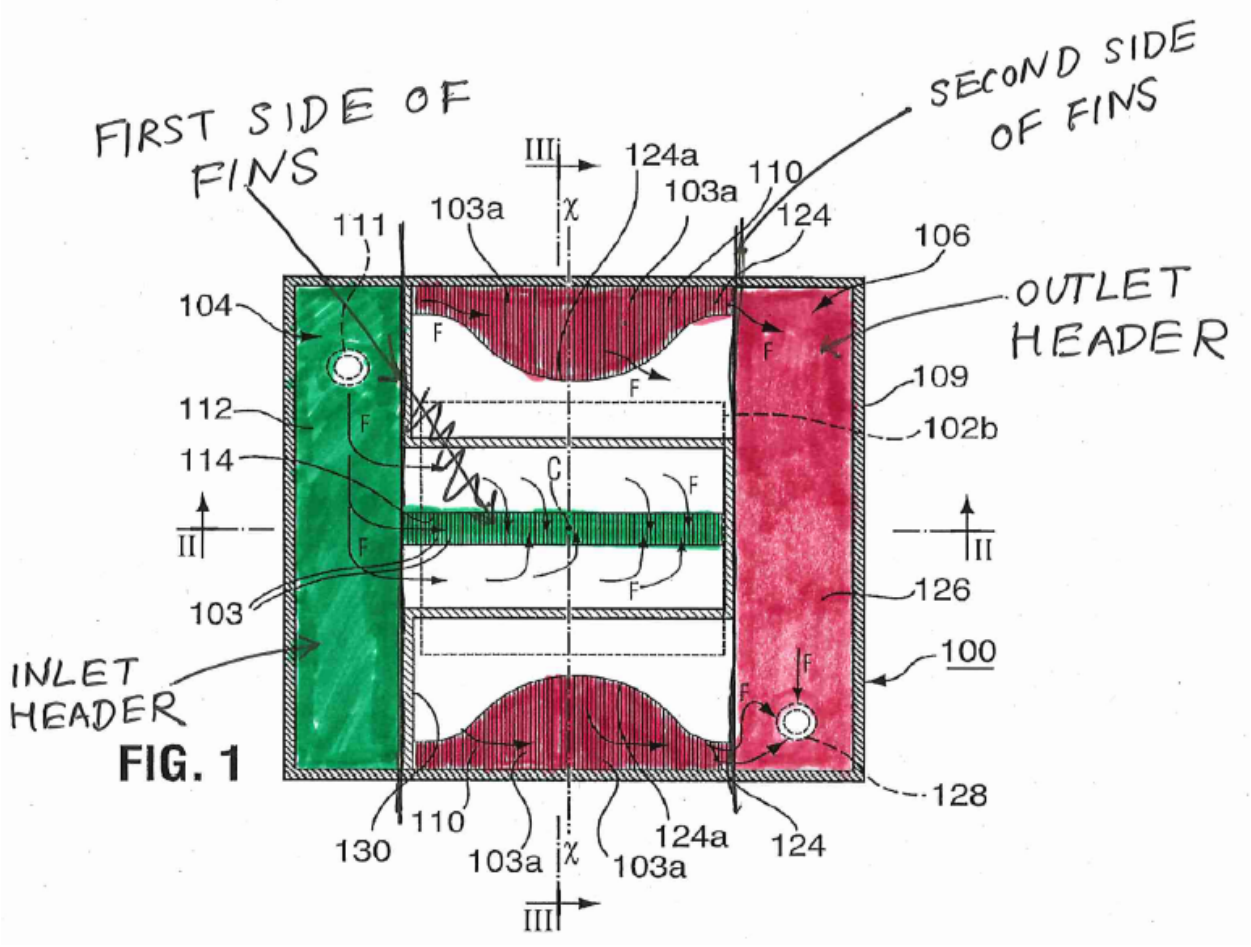
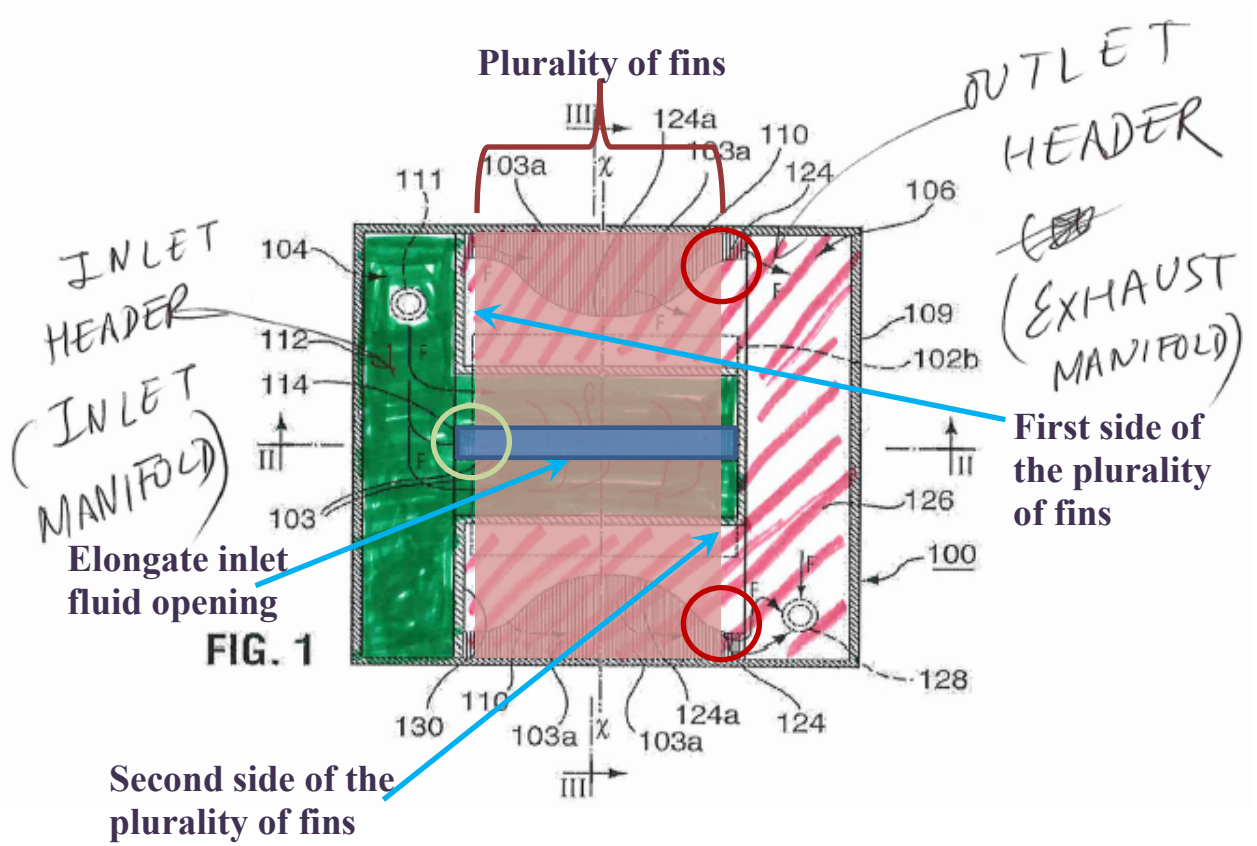


FIG. 1

28. Another way in which the claim language of claim 1 (as an example) could be mapped onto Figure 1 is shown by my annotations to Figure 1 on top of my previous annotations shown in Exhibit 45 of my December 16, 2019 deposition. As can be seen below, a plurality of

fins can be a subset of the entire array of fins. Additionally, a region of the inlet header (circled in light green) is adjacent a first side of the plurality of fins and a region (two regions circled in red) are adjacent a second side of the plurality of fins. The parallel language in claims 12 ("elongate aperture" / "inlet/outlet header region") and 14 ("inlet" / "inlet/outlet header region") can be similarly mapped.



29. As to the phrase, **"direct the cooling liquid from the central region toward the perimeter of the lower chamber,"** the claim language never expressly states that the cooling liquid, when being directed from the central region toward the perimeter of the lower chamber, has to *stay only in the lower chamber* during every moment of the entire flow duration. The plain and

ordinary meaning of the phrase is simply that the cooling liquid is directed to move from the central region as a *starting point* to the outside edge of the lower chamber as an *ending point*. The claim language does not restrict where the cooling liquid may pass through between those two points.

30. I disagree with Asetek's proposed construction of the phrase, "direct the cooling liquid from the central region toward the perimeter of the lower chamber," to be "direct the cooling liquid from the central region *through the lower chamber* toward the perimeter of the lower chamber." Asetek simply inserts the additional limitation "through the lower chamber" that does not exist in the claim language itself. This is not how a personal of ordinary skill in the art would have understood the phrase. It appears what Asetek is doing is importing a limitation from preferred embodiments, which I have been informed by counsel is inappropriate. The specification or prosecution history never clearly and unequivocally disclaims or otherwise excludes the possibility of the cooling liquid passing through passages or channels not necessarily located inside the lower chamber. Thus, in my opinion, the addition of the non-existent limitation "through the lower chamber" by Asetek is improper and not how a person of ordinary skill would have done.

31. I declare under penalty of perjury under the laws of the United States that the foregoing is true and correct to the best of my knowledge.

EXECUTED at Saratoga, California on this 19th day of March, 2021.

Himanshu Pokharna, Ph.D.

HIMANSHU POKHARNA, PhD (PURDUE), MBA (WHARTON)

Phone: 408-464-8007 Email: pokharna@gmail.com

Over 24 years of progressive experience in a variety of leadership roles in large companies as well as entrepreneurial environments with emphasis on energy technologies. Expertise in creating product strategy by mapping technology competencies to emerging market opportunities. Comfortable in deepest of technical discussions to board level business deliberations and can span from technology to strategy and P&L. Technologist with track record of successful introduction of new energy/mechanical/thermal technology in a broad array of computing, consumer, energy and Mil/aerospace products. Experienced in building and leading teams across geographies. Experienced as expert witness in Intellectual Property cases.

PROFESSIONAL EXPERIENCE

Inficold Inc. Founder and Board Member **04/15-Present**

A seed funded startup developing and commercializing thermal energy storage products.

- Founded and raised $1.67 M in seed and grant funding. Responsible for all aspects of the. company
- Built a 30 people team for developing a patented product which can attach to any air conditioning system and store energy in low cost phase change media to shift power consumption to low tariff duration.
- Developed relationships with the Indian policy setting bodies for milk cooling. Product is undergoing testing at a few of the largest dairies in India. Also negotiating demonstration projects with dairies in Africa.

Deeia Inc. Principal (Owner) **01/09-Present**

A thermal design, consulting and sourcing business with leading companies (Google, GoPro, Facebook, etc.) and startups as clients.

- Services focused on the characterization, development and enhancement of thermal design of systems including VR headsets, drones, data centers, servers, smart phones, tablets, networking systems etc.
- Assisting overseas manufacturers with strategic sales activities for products such as pyrolytic graphite sheets, EMI materials, foams and die cut parts for smartphone/consumer electronic applications.
- Developed thermal architecture of several products for startup companies (LED, drone, action camera).

Deep-Materials Inc (Founder and Board Member) **03/19-Present**

- A new Thermal Interface Materials company with high conductivity thermal gels and other TIM products

Sheetak Inc. Co-Founder, Board Member and VP Business Development **01/09-04/15**

A Series B funded company applying an innovative material for creating solid state energy converters with application in power generation, cooling and heat pumping products.

- Raised >$5M in venture funding and licensing revenues. Raised >$10M in non-dilutive R&D grants from US DoE (ARPA-e)/DoD. Responsible for teaming, proposal, contract negotiations, and project management.
- Identified a new product based upon our technology and deep analysis of refrigeration market. Licensed it to a leading conglomerate in their ultra-cheap refrigerator for the masses in India. The resulting low cost refrigerators in have received coverage in the *Economist, WSJ* and *HBR*. Responsible for end to end delivery (engineering, design, Chinese supply chain and component cost negotiations).
- Negotiated multiple licensing deals (~$ 1 M in upfront fees and royalties). Negotiated collaboration agreements with a large appliance manufacturer and a large automotive supplier.
- Responsible for developing internal processes for financial controls, reporting, auditing, and personnel policies. Attracted and hired a very capable team in US as well as built the company office in India.

12/08-10/09

Ventiva Inc. VP Product Management and Marketing
Strategic advisor/Part time VP of Thermal Engineering & Products 10/14-present

Ventiva is a top tier VC (Foundation Cap., DCM) funded startup focused on commercializing solid state fans.

- Responsible for providing product direction, market analysis, customer analysis, & thermal engineering. Convinced the company to focus on tablet & wireless charger cooling for its first product.
- Created customer and supplier relationships in Korea, Japan and Taiwan with mobile/PC customers and other ecosystem partners.

k-Technology Corp. VP Product Development 07/07-12/08

Leadership role in a defense hardware company, based upon an innovative high thermal conductivity material technology. Responsible for new product development.

- Led many SBIR projects for new product applications based upon the core materials technology.
- Evaluated partnership/acquisition opportunities and eventually assisted the CEO in selling the business to a larger player in the value chain.

Intel Corporation - Mobility Group 07/00-07/07

Group Manager (‘05-‘07), Thermal Technology Manager (‘02-‘05), Staff Engineer (‘00-‘02)

- Overall responsibility for thermal, mechanical technology development and deployment for Intel’s >$12.5 B Mobile Products Group (now part of PC Client Group). Built and managed a cross functional team of 27 mechanical/thermal engineers and program managers across the globe (US, Taiwan, Japan, India).
- Responsible for developing team strategic plan, providing leadership, mentoring of managers and managing ~$4 M annual budget. The team defined Intel’s laptop PC thermal mechanical roadmap as well as develops, enables and communicates mechanical design of future laptop PCs. Most of the laptops today are based on the thermal/mechanical architecture originally developed by this team.
- Established Intel’s mobile thermal technology advancement program. Formulated and managed collaborative development programs and investment in >15 supply chain partners for advancement in thermal component technology. The resulting products have led to 50% reduction in laptop thickness.
- Initiated heat pipe development programs with five of the leading heat pipe suppliers. Objective was to reduce evaporator and condenser resistances, reduce thickness to support thin laptops and evaluate new technologies such as lighter materials. Also hired a statistician to develop a training course to educate the vendors on use of statistical process control tools as a means to optimize performance and improve yields.
- Advised Intel Capital for investment in thermal, mechanical, fuel-cell and battery startups. Evaluated >25 investment opportunities. Managed Intel Capital investment in a company.
- Intel IP committee member. Responsible for evaluating employee disclosures for filing as patents.

Applied Materials Inc. Senior Mechanical Engineer 07/97-07/00

- Lead mechanical engineer for new product development group of low-k dielectric managing multiple hardware projects. Led cross-functional team for alpha exit of low-k CVD product.
- Developed and patented an innovative chamber end point detection methodology.

HIMANSHU POKHARNA, 3 408-464-8007 ◆

EDUCATION

MBA, THE WHARTON SCHOOL, UNIVERSITY OF PENNSYLVANIA	2006
PhD, PURDUE UNIVERSITY, Nuclear Engineering	1997
BS, MS,[1] INDIAN INSTITUTE OF TECHNOLOGY, BOMBAY, Mechanical Engineering	1990, 1992

DETAILS OF THE PRESENTATIONS PAPPERS, AND PATENTS

KEYNOTE/INVITED ADDRESSES & PAPERS[2],

1. Pokharna, H., "Application of Thermal Management in Energy Devices", Delivered at the Annual Taiwan Thermal Management Association Meeting in Taipei, April 2011.
2. Pokharna, H., "Solid State Energy Converters Coupled with Heat Pipes for Refrigeration and Power Generation", Fujikura Annual Forum, Nov 2010.
3. Pokharna, H., "Notebook Thermal Technology: Need for Standardized Metrology – Call to Action for Taiwan Thermal Management Association" Delivered at the Annual Taiwan Thermal Management Association Meeting in Taipei, April 10, 2007.
4. Mongia, R; Kuroda, M., and Pokharna, H., "Heat Pipe Needs in Future Mobile Platforms", Keynote address to the 14th International Heat Pipe Conference, Florianópolis, Brazil, 2007.
5. Machiroutu, S.V., Kluge, B., Kuroda, M., and Pokharna, H., "Design and Test Methodologies of Use of Heat Pipes in Laptop PCs," Keynote address to the 8th International Heat Pipe Symposium, Kumamoto, Japan, 2006.
6. *Pokharna, H , et. al. , Microchannel Cooling in Computing Platforms: Performance Needs and Challenges in Implementation", Keynote address to the second ASME-JSME International Microchannel Conference, at Rochester, NY, 2004. Published: Proceedings of the Second International Conference on Microchannels and Minichannels (ICMM2004). 10.1115/ICMM2004-2325. Page 109-118.

SELECTED JOURNAL PUBLICATIONS

7. *Mongia, R., Bhattacharya, A., Pokharna, H, "Skin Cooling and Other Challenges in Future Mobile Form Factor Computing Devices", Microelectronics Journal – vol. 39, pp. 992-1000, 2008.
8. *Ishii M., Revankar S.T., Pokharna H., et. al. Scaling of the Purdue University Multidimensional Integral Test Assembly (PUMA) for GE SBWR. Nuclear Engineering and Design, Vol. 186, 1998, pp. 177-211.
9. *Pokharna H., Mori M., and Ransom V.H., "The Particle Fluid Model and Using Lagrangian Representation in Two-Phase Flow Modeling." Nuclear Engineering and Design, Vol. 175, 1997, pp. 59-69.
10. *Pokharna H., Mori M., and Ransom V.H, "Regularization of Two-Phase Flow Models- A comparison of Mathematical and Numerical Approaches" Journal of Computational Physics, Vol. 134, July, 1997.

[1] The degrees were Bachelor's of Technology and Master's of Technology, equivalent to a B.S. and an M.S. in the United States, respectively.

[2] `Papers, and presentations marked with * were peer reviewed.

PRESENTATIONS AND OTHER PUBLICATIONS

11. *K. Varadarajan, R. K. Mongia, H. Pokharna, J. Pan, K. Tien and M. Wu, "Lid cooling for notebooks," 2008 11th Intersociety Conference on Thermal and Thermomechanical Phenomena in Electronic Systems, Orlando, FL, 2008, Published: *11th Intersociety Conference on Thermal and Thermomechanical Phenomena in Electronic Systems, Orlando, FL, 2008*, pp. 591-597. pp. 591-597.
12. *Mongia, R.; Machiroutu, S., Pokharna, H.; “Mobile Thermal Challenges in Future Platforms”, Presented at Thermes II, Santa Fe, NM, 2007. Published: *Thermal Challenges in Next Generation Electronic Systems (THERMES II 2007)* Edited by Suresh V. Garimella, Amy S. Fleischer, Volume 39, Issue 7, Pages 929-1030 (July 2008)
13. *Machiroutu, S.V., Pokharna, H., Kuroda, M., “Challenges and Advances of Heat Pipes in Cooling Notebook Systems”, Presented at Interpack Conference, Vancouver, British Columbia, Canada, July 8-12, 2007. Published: *Proc. ASME. 42770; ASME 2007 InterPACK Conference, Volume 1.* IPACK2007-33249. *Pages: 677-687*
14. *Kuroda, M., Machiroutu, S.V., and Pokharna, H., “Use of Heat Pipes in Multiple Component Cooling in Laptop PCs,” 8th International Heat Pipe Symposium, Kumamoto, Japan, 2006. Published:: *Heat Pipe: Science and Technology ; Proceedings of the 8th International Heat Pipe Symposium,* Edited by Hideaki Imura, Nihon-Hito-Paipu-Kyōkai September 24 - 27, 2006 Kumamoto, Japan.
15. *Khandani,S., Pokharna, H., Machiroutu,S., DiStefano, E., “Remote Heat Pipe Based Heat Exchanger performance in Notebook Cooling”, Presented at the ASME Summer Heat Transfer Conference, San Francisco, 2005. Published: *Heat Transfer: Volume 4 ():715-719. doi:10.1115/HT2005-72069* Pages – 715-719.
16. *DiStefano, E., Pokharna, H. and Machiroutu, S.V., "Raising the Bar for Heat Pipes in Notebook Cooling," 13th International Heat Pipe Conference, Shanghai, China, September 21–25, 2004. Published: *13th International Heat Pipe Conference: September 21-25, 2004, Shanghai, China* Edited by: Zhongguo Kong, Jian Ji, Shu Yan, Jiu Yuan. China Academy of Space Technology, 2004
17. *Pokharna-H; Ransom-VH; Mori-M “Extension of the particle-fluid model for transient analysis of bubbly two-phase flow to branched flow passages”. Eighth International Topical Meeting on Nuclear Reactor Thermal-Hydraulics. NURETH-8. Published:: *New Horizons in Nuclear Reactor Thermal-Hydraulics. Atomic Energy Soc. Japan, Tokyo, Japan; 1997*; vol–1 (xxi+xv+1830) pp. p.558-65.
18. *Pokharna H., and Ransom V. H., “Development of a Particle-Fluid Model for Transient Analysis of Bubbly Two-phase Flows in Parallel Channels.” Presented at the International Mechanical Engineers Conference and Exposition, Atlanta, November, 1996. Published: *ASME FED, Vol-242*.
19. *Pokharna H., Mori M. and Ransom V.H., “The Particle Fluid Model and Using Lagrangian Representation in Two-Phase Flow Modeling.”, Presented at the Fourth US-Japan Conference in Tsoukoba, July 1996.
20. Ishii M., Revankar S.T., Pokharna H. et. al. “Scientific Design of Purdue University Multi-Dimensional Integral Test Assembly (PUMA) for GE SBWR.”, NUREG/ CR-6309, (National report published by Nuclear Regulatory Commission). 1996. Published: Proceedings of the 7th International Meeting on Nuclear Reactor Thermal-Hydraulics (NURETH 7), Sep. 10-15, 1995, Saratoga Springs, New York.
21. *Ishii M., Revankar S.T., Pokharna H., and Ransom V.H., “Scaling for Integral Simulation of Thermalhydraulic Phenomena in SBIR during LOCA.”, Presented at NURETH-7, Saratoga

Springs, NY, Sep10-15, 1995. Published: Proceedings of the 7th International Meeting on Nuclear Reactor Thermal-Hydraulics (NURETH 7), Sep. 10-15, 1995, , Saratoga Springs, New York. Compiled by: R. C. Block, F. Feiner.pp: 1272-1290/

22. *Pokharna H., Lele S., Wang W., Ishii M., Ransom V.H., "Investigation of Scaling Criterion Using RELAP5 for SBWR Integral Test Facility Design." Presented at ANS Annual Meeting, San Francisco, Nov14-18, 1993. Published: *Transactions of the American Nuclear Society, 540-541.*
23. *Pokharna H. and Doshi J.B., "Analysis of Dynamic Instability in Boiling Systems.", Presented at Winter Annual Meeting of ASME, Los Angeles, 1992. Published: Proceedings of Winter Annual Meeting, Anaheim, CA, USA 11/08-13/92. Pages: 1-9.

PATENTS

Issued US patents:

Publication Number	Title
US9903621B1	Cooling system with thermal battery
US9574832B2	Enabling an aluminum heat exchanger with a working fluid
US8043703B2	Thermally conductive graphite reinforced alloys
US7494628B2	Apparatus for abatement of by-products generated from deposition processes and cleaning of deposition chambers
US7443670B2	Systems for improved blower fans
US7308931B2	Heat pipe remote heat exchanger (RHE) with graphite block
US7300244B2	Cooling fan noise reduction apparatus, systems, and methods
US7269005B2	Pumped loop cooling with remote heat exchanger and display cooling
US7243497B2	Apparatus to use a refrigerator in mobile computing device
US7288895B2	System to improve display efficiency based on recycling local heat source
US7283360B2	Enhanced flow channel for component cooling in computer systems
US7281388B2	Apparatus to use a refrigerator in mobile computing device
US7272006B2	IC coolant microchannel assembly with integrated attachment hardware
US7259965B2	Integrated circuit coolant microchannel assembly with targeted channel configuration
US7203064B2	Heat exchanger with cooling channels having varying geometry
US7193316B2	Integrated circuit coolant microchannel with movable portion
US7123479B2	Enhanced flow channel for component cooling in computer systems
US7104313B2	Apparatus for using fluid laden with nanoparticles for application in electronic cooling
US7060234B2	Process and apparatus for abatement of by products generated from deposition processes and cleaning of deposition chambers
US7048038B2	Increased thermal capability of portable electronic device in stationary or docked mode
US7031159B2	Parallel heat exchanger for a component in a mobile system
US7023697B2	Actuation membrane for application to a card slot of a system
US6958912B2	Enhanced heat exchanger
US6906919B2	Two-phase pumped liquid loop for mobile computer cooling
US6899763B2	Lid cooling mechanism and method for optimized deposition of low-K dielectric using TR methylsilane-ozone based processes
US6937472B2	Apparatus for cooling heat generating components within a computer system enclosure
US6903930B2	Parallel heat exchanger for a component in a mobile system
US6845625B1	Reversible two-phase and refrigeration loop

US6837057B2	Docking station to cool a computer
US6845008B2	Docking station to cool a notebook computer
US6837058B1	Tablet air cooling dock
US6801430B1	Actuation membrane to reduce an ambient temperature of heat generating device
US6795311B2	Method and apparatus for cooling portable computers
US6674640B2	Increased thermal capability of portable electronic device in stationary or docked mode
US6646874B2	Mobile computer system with detachable thermoelectric module for enhanced cooling capability in a docking station
US6596343B1	Method and apparatus for processing semiconductor substrates with hydroxyl radicals
US6595022B2	Computer system having a refrigeration cycle utilizing an adsorber/desorber for purposes of compression
US6528116B1	Lid cooling mechanism and method for optimized deposition of low-k dielectric using tri methylsilane-ozone based processes
US6506994B2	Low profile thick film heaters in multi-slot bake chamber
US6415612B1	Method and apparatus for external cooling an electronic component of a mobile hardware product, particularly a notebook computer, at a docking station having a thermoelectric cooler
US6358327B1	Method for endpoint detection using throttle valve position
US6255222B1	Method for removing residue from substrate processing chamber exhaust line for silicon-oxygen-carbon deposition process

Applied/Pending US Patents (Published):

Publication Number	Title
US20160133814A1	FUEL-FLEXIBLE THERMAL POWER GENERATOR FOR ELECTRIC LOADS
US20150155413A1	SOLAR THERMOELECTRIC GENERATOR WITH INTEGRATED SELECTIVE WAVELENGTH ABSORBER
US20140318152A1	METHOD AND APPARATUS FOR THERMOELECTRIC COOLING OF FLUIDS
US20130048250A1	HEAT PIPE MADE OF COMPOSITE MATERIAL AND METHOD OF MANUFACTURING THE SAME
US20090255660A1	High Thermal Conductivity Heat Sinks With Z-Axis Inserts
US20090166014A1	Enabling an aluminum heat exchanger with a working fluid
US20090135560A1	HIGH EFFICIENCY FLUID MOVERS
US20090075120A1	Thermally conductive graphite reinforced alloys
US20090002939A1	Systems and methods for fan speed optimization
US20080130221A1	Thermal hinge for lid cooling
US20070284089A1	Method, apparatus and system for carbon nanotube wick structures
US20070227707A1	Method, apparatus and system for providing for optimized heat exchanger fin spacing
US20070217147A1	INTEGRATED CIRCUIT COOLANT MICROCHANNEL ASSEMBLY WITH TARGETED CHANNEL CONFIGURATION
US20070146993A1	Method, apparatus and computer system for enhancement of thermal energy transfer
US20070177349A1	High efficiency fluid mover
US20070076376A1	Method, apparatus and computer system for providing for the transfer of thermal energy
US20070077139A1	Cooling fan noise reduction apparatus, systems, and methods
US20070076374A1	IC coolant microchannel assembly with integrated attachment hardware
US20070002541A1	Enhanced flow channel for component cooling in computer systems
US20060226539A1	Integrated circuit coolant microchannel assembly with targeted channel configuration

US20060198769A1	Apparatus for abatement of by-products generated from deposition processes and cleaning of deposition chambers
US20060131733A1	Integrated circuit coolant microchannel with movable portion
US20060152900A1	Systems for improved blower fans
US20060113066A1	Heat exchanger configuration for pumped liquid cooling computer systems
US20060113064A1	Heat pipe remote heat exchanger (RHE) with graphite block
US20050285261A1	Thermal management arrangement with channels structurally adapted for varying heat flux areas
US20050284166A1	Apparatus to use vapor compression refrigeration in a mobile computing device
US20050217278A1	Apparatus to use a magnetic based refrigerator in mobile computing device
US20050219819A1	Methods to improve heat exchanger performance in liquid cooling loops
US20050217827A1	Apparatus to use a refrigerator in mobile computing device
US20050217279A1	Apparatus to use a refrigerator in mobile computing device
US20050139345A1	Apparatus for using fluid laden with nanoparticles for application in electronic cooling
US20050141195A1	Folded fin microchannel heat exchanger
US20050146852A1	Parallel heat exchanger for a component in a mobile system
US20050145371A1	Thermal solution for electronics cooling using a heat pipe in combination with active loop solution
US20050128702A1	Heat exchanger with cooling channels having varying geometry
US20050122688A1	Enhanced flow channel for component cooling in computer systems
US20050103480A1	Enhanced heat exchanger
US20050111183A1	Pumped loop cooling with remote heat exchanger and display cooling
US20050104526A1	System to improve display efficiency based on recycling local heat source
US20050099775A1	Pumped liquid cooling for computer systems using liquid metal coolant
US20050126761A1	Heat pipe including enhanced nucleate boiling surface
US20050068724A1	Two-phase pumped liquid loop for mobile computer cooling
US20050058867A1	Integrated platform and fuel cell cooling
US20050058866A1	Integrated platform and fuel cell cooling
US20050013116A1	Actuation membrane for application to a card slot of a system
US20040261421A1	TABLET AIR COOLING DOCK
US20040223302A1	Apparatus for cooling heat generating components within a computer system enclosure
US20040201959A1	Increased thermal capability of portable electronic device in stationary or docked mode
US20040123604A1	Docking station to cool a computer
US20040123977A1	External attachable heat exchanger
US20040125562A1	Parallel heat exchanger for a component in a mobile system
US20030221621A1	Method and apparatus for processing semiconductor substrates with hydroxyl radicals
US20030123223A1	Method and apparatus for cooling portable computers
US20030066482A1	Lid cooling mechanism and method for optimized deposition of low-K dielectric using TRI methylsilane-ozone based processes
US20020190051A1	LOW PROFILE THICK FILM HEATERS IN MULTI-SLOT BAKE CHAMBER
US20030017087A1	Process and apparatus for abatement of by products generated from deposition processes and cleaning of deposition chambers
US20030002252A1	Increased thermal capability of portable electronic device in stationary or docked mode
US20030000231A1	Computer system having a refrigeration cycle utilizing an adsorber/desorber for purposes of compression
US20020186531A1	Mobile computer system with detatchable thermoelectric module for enhanced cooling capability in a docking station

US20020141152A1	Docking station to cool a notebook computer

Issued/Applied/Pending International Patents (Published):

Publication Number	Title
EP1665434B1	INTEGRATED PLATFORM AND FUEL CELL COOLING | INTEGRIERTE PLATTFORM UND BRENNSTOFFZELLENKÜHLUNG | REFROIDISSEMENT INTEGRE DE PLATE-FORME ET DE PILE A COMBUSTIBLE
EP1148150B1	Method and apparatus for processing semiconductor substrates with hydroxyl radicals | Verfahren und Vorrichtung zur Behandlung von Halbleitersubstraten mit Hydroxylradikalen | Procédé et appareillage pour le traitement des substrats de sémiconducteur par des radicaux hydroxylés
EP1671218B1	REVERSIBLE TWO-PHASE AND REFRIGERATION LOOP | REVERSIBLE ZWEIPHASEN- UND KÜHLSCHLEIFE | BOUCLE DE REFRIGERATION ET A DEUX PHASES REVERSIBLE
EP1623612B1	AN ACTUATION MEMBRANE FOR APPLICATION TO A CARD SLOT OF A SYSTEM | EINE BETÄTIGUNGSMEMBRAN ZUR VERWENDUNG IN EINEM SYSTEMSKARTENSCHLITZ | MEMBRANE D'ENTRAINEMENT S'APPLIQUANT SUR UNE POSITION D'ENFICHAGE DE CARTE DANS UN SYSTEME
EP2807432A1	METHOD AND APPARATUS FOR THERMOELECTRIC COOLING OF FLUIDS | VERFAHREN UND VORRICHTUNG ZUR THERMOELEKTRISCHEN KÜHLUNG VON FLÜSSIGKEITEN | PROCÉDÉ ET APPAREIL DE REFROIDISSEMENT THERMOÉLECTRIQUE DE FLUIDES
EP1148150A3	Method and apparatus for processing semiconductor substrates with hydroxyl radicals | Verfahren und Vorrichtung zur Behandlung von Halbleitersubstraten mit Hydroxylradikalen | Procédé et appareillage pour le traitement des substrats de sémiconducteur par des radicaux hydroxylés
EP1665434A2	INTEGRATED PLATFORM AND FUEL CELL COOLING | INTEGRIERTE PLATTFORM UND BRENNSTOFFZELLENKÜHLUNG | REFROIDISSEMENT INTEGRE DE PLATE-FORME ET DE PILE A COMBUSTIBLE
EP1671218A2	REVERSIBLE TWO-PHASE AND REFRIGERATION LOOP | REVERSIBLE ZWEIPHASEN- UND KÜHLSCHLEIFE | BOUCLE DE REFRIGERATION ET A DEUX PHASES REVERSIBLE
EP1623612A2	AN ACTUATION MEMBRANE FOR APPLICATION TO A CARD SLOT OF A SYSTEM | EINE BETÄTIGUNGSMEMBRAN ZUR VERWENDUNG IN EINEM SYSTEMSKARTENSCHLITZ | MEMBRANE D'ENTRAINEMENT S'APPLIQUANT SUR UNE POSITION D'ENFICHAGE DE CARTE DANS UN SYSTEME
EP1148150A2	Method and apparatus for processing semiconductor substrates with hydroxyl radicals | Verfahren und Vorrichtung zur Behandlung von Halbleitersubstraten mit Hydroxylradikalen | Procédé et appareillage pour le traitement des substrats de sémiconducteur par des radicaux hydroxylés
EP1079000A1	Method for removing residue from an exhaust line | Verfahren zur Entfernung von Absetzungen in einer Abgasleitung | Procédé d'élimination les dépôts dans une ligne d'échappement
EP1077274A1	Method for depositing thin films in particular of a low-k dielectric | Verfahren zur Abscheidung von dünnen Schichten insbesondere eines Dielektrikums mit niedrigem k-Wert | Méthode de déposition des couches minces notamment d'un matériau diélectrique à faible constante diélectrique

WO2013173450A9	INTEGRATED SELECTIVE WAVELENGTH ABSORBER SOLAR THERMOELECTRIC GENERATOR | GÉNÉRATEUR THERMOÉLECTRIQUE SOLAIRE AVEC ABSORBEUR DE LONGUEUR D'ONDE SÉLECTIF INTÉGRÉ
WO2013074057A1	METHOD AND APPARATUS FOR THERMOELECTRIC COOLING OF FLUIDS | PROCÉDÉ ET APPAREIL DE REFROIDISSEMENT THERMOÉLECTRIQUE DE FLUIDES
WO2009035666A3	THERMALLY CONDUCTIVE GRAPHITE REINFORCED ALLOYS | ALLIAGES THERMO-CONDUCTEURS RENFORCÉS PAR DU GRAPHITE
WO2009035666A2	THERMALLY CONDUCTIVE GRAPHITE REINFORCED ALLOYS | ALLIAGES THERMO-CONDUCTEURS RENFORCÉS PAR DU GRAPHITE
WO2008079430A3	METHOD, APPARATUS AND SYSTEM FOR CARBON NANOTUBE WICK STRUCTURES | PROCÉDÉ, APPAREIL ET SYSTÈME POUR STRUCTURES EN RÉSEAU CAPILLAIRE À NANOTUBES DE CARBONE
WO2008079430A9	METHOD, APPARATUS AND SYSTEM FOR CARBON NANOTUBE WICK STRUCTURES | PROCÉDÉ, APPAREIL ET SYSTÈME POUR STRUCTURES EN RÉSEAU CAPILLAIRE À NANOTUBES DE CARBONE
WO2008079430A2	METHOD, APPARATUS AND SYSTEM FOR CARBON NANOTUBE WICK STRUCTURES | PROCÉDÉ, APPAREIL ET SYSTÈME POUR STRUCTURES EN RÉSEAU CAPILLAIRE À NANOTUBES DE CARBONE
WO2008008085A3	IC COOLANT MICROCHANNEL ASSEMBLY WITH INTEGRATED ATTACHMENT HARDWARE | ENSEMBLE À MICRO-CANAUX DE RÉFRIGÉRANT DE CIRCUIT INTÉGRÉ AVEC MATÉRIEL DE FIXATION INTÉGRÉ
WO2008008085A2	IC COOLANT MICROCHANNEL ASSEMBLY WITH INTEGRATED ATTACHMENT HARDWARE | ENSEMBLE À MICRO-CANAUX DE RÉFRIGÉRANT DE CIRCUIT INTÉGRÉ AVEC MATÉRIEL DE FIXATION INTÉGRÉ
WO2007062208A1	HIGH EFFICIENCY FLUID MOVER | DISPOSITIF DE DEPLACEMENT DE LIQUIDE A HAUT RENDEMENT
WO2007041123A1	IC COOLANT MICROCHANNEL ASSEMBLY WITH INTEGRATED ATTACHMENT HARDWARE | ENSEMBLE MICROCANAL DE REFROIDISSEMENT A CIRCUIT INTEGRE AVEC MATERIEL JOINT
WO2006074447A3	SYSTEMS FOR IMPROVED BLOWER FANS | SYSTEMES POUR VENTILATEURS AMELIORES
WO2005033917A8	REVERSIBLE TWO-PHASE AND REFRIGERATION LOOP | BOUCLE DE REFRIGERATION ET A DEUX PHASES REVERSIBLE
WO2006074447A2	SYSTEMS FOR IMPROVED BLOWER FANS | SYSTEMES POUR VENTILATEURS AMELIORES
WO2005029626A3	INTEGRATED PLATFORM AND FUEL CELL COOLING | REFROIDISSEMENT INTEGRE DE PLATE-FORME ET DE PILE A COMBUSTIBLE
WO2005051065A3	PUMPED LIQUID COOLING FOR COMPUTER SYSTEMS USING LIQUID METAL COOLANT | REFROIDISSEMENT POUR SYSTEMES INFORMATIQUES PAR LIQUIDE DE REFROIDISSEMENT METALLIQUE POMPE
WO2005033917A3	REVERSIBLE TWO-PHASE AND REFRIGERATION LOOP | BOUCLE DE REFRIGERATION ET A DEUX PHASES REVERSIBLE
WO2005067038A1	FOLDED FIN MICROCHANNEL HEAT EXCHANGER | ECHANGEUR DE CHALEUR A MICROCANAUX A AILETTE REPLIEE

WO2005033917A2	REVERSIBLE TWO-PHASE AND REFRIGERATION LOOP | BOUCLE DE REFRIGERATION ET A DEUX PHASES REVERSIBLE
WO2005051065A2	PUMPED LIQUID COOLING FOR COMPUTER SYSTEMS USING LIQUID METAL COOLANT | REFROIDISSEMENT POUR SYSTEMES INFORMATIQUES PAR LIQUIDE DE REFROIDISSEMENT METALLIQUE POMPE
WO2005029626A2	INTEGRATED PLATFORM AND FUEL CELL COOLING | REFROIDISSEMENT INTEGRE DE PLATE-FORME ET DE PILE A COMBUSTIBLE
WO2004103048A3	AN ACTUATION MEMBRANE FOR APPLICATION TO A CARD SLOT OF A SYSTEM | MEMBRANE D'ENTRAINEMENT S'APPLIQUANT SUR UNE POSITION D'ENFICHAGE DE CARTE DANS UN SYSTEME
WO2004103048A2	AN ACTUATION MEMBRANE FOR APPLICATION TO A CARD SLOT OF A SYSTEM | MEMBRANE D'ENTRAINEMENT S'APPLIQUANT SUR UNE POSITION D'ENFICHAGE DE CARTE DANS UN SYSTEME
DE602004008615T2	EINE BETÄTIGUNGSMEMBRAN ZUR VERWENDUNG IN EINEM SYSTEMKARTENSCHLITZ
DE112006000130B4	Lüfteranordnung für Kühlsysteme
DE112006000130T5	Systeme für verbesserte Kühleinrichtungen, wie Lüfter
DE112007001304T5	Verfahren, Vorrichtung und System für Kohlenstoffnanoröhrendochtstrukturen
JP2002064095A	METHOD AND DEVICE FOR PROCESSING SEMICONDUCTOR SUBSTRATE WITH HYDROXYL RADICAL | The processing method and apparatus of a semiconductor substrate using a hydroxyl radical
JP2001140076A	IMPROVED METHOD FOR REMOVING RESIDUE FROM EXHAUST LINE OF SUBSTRATE TREATMENT CHAMBER TO DEPOSIT SILICON- OXYGEN-CARBON | The method improved in order to remove residue from the gas discharge line of the substrate treating chamber which performs the deposition process of silicon|silicone- oxygen-carbon
KR1024757B1	METHOD, APPARATUS AND SYSTEM FOR CARBON NANOTUBE WICK STRUCTURES | The method for the carbon nanotube wick structure, and the apparatus and system.
KR715074B1	METHOD AND APPARATUS FOR PROCESSING SEMICONDUCTOR SUBSTRATES WITH HYDROXYL RADICALS | METHOD AND APPARATUS FOR PROCESSING SEMICONDUCTOR SUBSTRATE WITH HYDROXYL RADICAL | A method and apparatus for processing the semiconductor substrate as the hydroxyl radical.
KR696030B1	IMPROVED METHOD FOR REMOVING RESIDUE FROM SUBSTRATE PROCESSING CHAMBER EXHAUST LINE FOR SILICON-OXYGEN-CARBON DEPOSITION PROCESS | METHOD FOR REMOVING RESIDUE FROM EXHAUST LINE | The method for removing the residue from the substrate processing chamber exhaust line of the silicon-oxygen - carbon vapor deposition process.
KR2009009927A	METHOD, APPARATUS AND SYSTEM FOR CARBON NANOTUBE WICK STRUCTURES | The method for the carbon nanotube wick structure, and the apparatus and system.
KR2006006961A	AN ACTUATION MEMBRANE FOR APPLICATION TO A CARD SLOT OF A SYSTEM | The actuation membrane for applying to the card slot of the system.
KR2001021403A	METHOD FOR REMOVING RESIDUE FROM EXHAUST LINE
CN101438402A	Method, apparatus and system for carbon nanotube wick structures
CN101317265A	IC coolant microchannel assembly with integrated attachment hardware | IC coolant micro-channel assembly with integrated connecting component
CN101133377A	Systems for improved blower fans
CN101015082A	Integrated platform and fuel cell cooling | Cooling of integration platform and fuel cell

CN1882900A	Reversible two-phase and refrigeration loop | a reversible two-phase and refrigeration loop
CN1799297A	An actuation membrane for application to a card slot of a system | driving film for application to the system slot
CN101438402B	Method, apparatus and system for carbon nanotube wick structures | Method, device and system for carbon nano-tube core structure.
CN1799297B	An actuation membrane for application to a card slot of a system | applied to the system slot of driving film
CN101133377B	Systems for improved blower fans | for improved blower fan system
CN101317265B	IC coolant microchannel assembly with integrated attachment hardware | with integrated connection part of IC coolant micro-channel assembly
CN100565996C	Integrated platform and fuel cell cooling | Cooling of integration platform and fuel cell
CN100447707C	Reversible two-phase and refrigeration loop | Method and system for reversible switching of two-phase and refrigeration loop
TWM502162U	Composite material heat pipe
TW201309997A	Composite material heat pipe and manufacturing method thereof
TWI372138B	Heat pipe, apparatus and system with carbon nanotube wick structures
TWI324296B	Systems for improved blower fans
DE60139912D1	Verfahren und Vorrichtung zur Behandlung von Halbleitersubstraten mit Hydroxylradikalen
DE602004022566D1	REVERSIBLE ZWEIPHASEN- UND KÜHLSCHLEIFE
TWI315463B	Ic coolant microchannel assembly with integrated attachment hardware
TW200806576A	Method, apparatus and system for carbon nanotube wick structures
DE602004008615D1	EINE BETÄTIGUNGSMEMBRAN ZUR VERWENDUNG IN EINEM SYSTEMSKARTENSCHLITZ
TW200720898A	Ic coolant microchannel assembly with integrated attachment hardware
TW200629048A	Systems for improved blower fans
TWI267338B	Apparatus for cooling heat generating devices
TW200525340A	Pumped liquid cooling for computer systems using liquid metal coolant
TWI237921B	Integrated platform and fuel cell cooling
TW200526107A	Folded fin microchannel heat exchanger
TW200511637A	Integrated platform and fuel cell cooling
TW200425829A	An actuation membrane for application to a card slot of a system

EXPERT WITNESS ENGAGEMENTS

- Represented the defendant for the Case No. 3:12-cv-04498-EMC: ASETEK HOLDINGS, INC. and ASETEK A/S, Plaintiffs, v. COOLIT SYSTEMS INC., Defendant. Prepared expert reports for patent invalidity, patent infringement, rebuttal to opposing expert witness reports of invalidity and infringement reports. Provided testimony during deposition.
- Prepared IPR for a patent in server thermal management.
- Currently representing the defendant in a patent lawsuit involving mechanical aspects of a vapor chamber product used in computing products thermal management. Provided expert report on claim construction and testified during deposition (district court litigation).

- Prepared IPRs (201900144, 201900146, 2019000334, 201900337, 201900146) for three patents (US 7066240, 7100679, 7100680) related to the abovementioned lawsuit. Provided deposition testimony related to these IPRs.
- Retained by Patent owner as an expert for Ex Partes Review of a blast furnace cooling stave patent (2019).
- Prepared expert report for IPRs for a patent on liquid cooling for thermal management of electronics (IPR2019-00705). Deposition on Feb 4, 2020.
- Serving as an expert witness for the matter pending before the U.S. District Court, Northern District of California between Asetek Danmark A/S versus CoolIT Systems; case number 3:19-cv-00410-EMC. Provided claim construction report and deposition testimony for the same.